Transvalvular Left Ventricular Assistance in Cardiogenic Shock Secondary to Acute Myocardial Infarction

Evidence for Recovery From Near Fatal Myocardial Stunning

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Objectives. The purpose of this study was t test the hypothesis that transvalvular left ventricular assistance would support the circulation in patients with cardiogenic shock secondary to acute myocardial infarction and allow recovery of function in patients with a reversibly damaged (s.unned) left ventricle.

Background. Cardiogenic shock occurs in 7.5% of patients presenting with acute myocardial infarction, resulting in survival of only 20%. Despite the use of aggressive interventional therapy in patients with shock secondary to anterior myocardial infarction, survival remains as low as 33%.

Methods. We studied 11 patients with acute myocardial infarction and cardiogenic shock, as defined by a cardiac index <2 liters/min per m^2, pulmonary capillary wedge pressure >18 mm Hg and systolic blood pressure <90 mm Hg during positive inotropic therapy. Patients were 57 ± 13 years old (mean ± SD) and had a mean left ventricular ejection fraction of 25 ± 11%, mean arterial pressure of 69 ± 13 mm Hg and mean cardiac index of 1.6 ± 0.4 liters/min per m^2 on admission to the study.

Results. During the 1st 24 h of left ventricular assistance, pulmonary capillary wedge pressure decreased from 26 ± 4 to 16 ± 4 mm Hg (p = 0.01), cardiac index increased from 1.6 ± 0.4 to 2.4 ± 0.4 liters/min per m^2, and the dopamine hydrochloride dose decreased from 51 ± 92 to 18 ± 12 µg/kg body weight per min. In survivors, cardiac index improved to 3.2 ± 0.5 liters/min per m^2 (p = 0.01), and left ventricular ejection fraction improved to 34 ± 5% (p < 0.05). The overall survival in the study group was 4 (36%) of 11 patients (95% confidence interval [CI] 8% to 65%), and 4 (66%) of 6 patients (95% CI 29% to 100%) with a Q wave anterior myocardial infarction survived.

Conclusions. Transvalvular left ventricular support during cardiogenic shock complicating acute myocardial infarction is feasible and results in significant hemodynamic and functional improvement.

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Cardiogenic shock complicating acute myocardial infarction is associated with a survival rate of 20% that has not changed since 1975 (1). This condition occurs in 7.5% of all patients with acute myocardial infarction admitted to the hospital (1). Early reports of intraaortic balloon pumping for cardiogenic shock secondary to acute myocardial infarction suggested a survival rate of 16% in patients with balloon pumping alone compared with 40% for those with balloon pumping followed by coronary artery bypass surgery (2). Willerson et al. (3)

reported that the survival rate in patients with shock secondary to acute anterior myocardial infarction was only 11% despite intraaortic balloon pumping. DeWood et al. (4) demonstrated that intraaortic counterpulsation was useful in myocardial infarction complicated by shock when coronary artery bypass surgery was carried out within 16 h of onset of symptoms. In their study (4), the survival rate with early bypass surgery combined with intraaortic counterpulsation was 75% compared with 29% for revascularization performed >18 h after the onset of symptoms. Lee et al. (5) reported similar results utilizing emergency coronary angioplasty in patients with myocardial infarction and shock. In their study successful emergency coronary angioplasty was associated with a survival rate of 69% compared with only 20% for unsuccessful angioplasty (5). In contrast, Bates and Topol (6) found that the survival rate using thrombolysis alone in patients with acute myocardial infarction and cardiogenic shock was only 30%, whereas patients treated successfully with both thrombolysis and angioplasty had 70% survival rate. In patients with anterior myocardi